5.2.4.2 Soil and Plant Salvage

Description

Plant and soil salvage involves harvesting onsite, or from another available construction site, and saving, storing, and replanting plants and as much soil with these plants as possible. Plants to be reclaimed for use in a project are cut as blocks of soil from their growing site.

As much length, width, and depth of soil as is economically feasible should be included. The cut block of soil and plants, or "sod," can vary from 4 to 6 inches deep for small woody and herbaceous plants, to up to 18 inches or more when salvaging medium-sized trees and shrubs. The length and width of each soil block are dependent on the technique chosen for moving the sods. Salvaging soil blocks is an alternative to stockpiling topsoil and to conventional transplanting techniques, such as digging and preparing balled and burlapped, container, or bare root plants. The salvage method is the fastest way to cover a site with living plants. If the necessary machinery is readily available, this method is also the most economical way to stabilize or re-vegetate large areas of bare soil.

Additional benefits include retaining a wide diversity of plants, often not available in the commercial nursery trade, with soils containing a full complement of biological life, including associated fungi, micro and macro organisms, seeds, and seedlings.

This method is most effective in stabilizing and re-vegetating stream banks and riparian corridors, or steep slopes, where a local source of retrievable plants is available.

BMP Functions Table

Native vegetation salvaged with its native soil can be immediately placed on a new site and establishes very quickly. It provides instant stormwater benefits including reduced peak discharge and runoff, slope and water channel stabilization, and reduced erosion and sedimentation. In addition, it provides habitat, sequesters carbon, and reduces the urban heat island effect.

BMP	Applicability	Volume Reduction	Water Quality	Peak Rate Reduction	Recharge	Runoff Temperature Mitigation	Heat Island	Habitat Creation	Maintenance Burden	Cost
Soil and Plant Salvage	S/R	H	H	H	H	H	L	H	L	M

KEY: U = Urban; S = Suburban; R = Rural; H = High; M = Medium; L = Low

Key Design Guidelines

- Salvage existing vegetation and soil that would otherwise be lost during construction.
- Prioritize salvage based on quality of vegetation and soils, ease of access, ease of removal, and establishment in a new site.
- Match salvage vegetation to the physical conditions of the new site (wet/dry, sunny/shady, and exposed/sheltered).
- Work with existing resources to salvage and replace plant blocks, understanding the contractor's existing or available machinery, onsite resources, local skills, budget, etc.

Advantages

- Vegetation and high-quality soil take many years to establish and to reach their full stormwater management potential. Salvaging existing soil and vegetation provides immediate stormwater management benefits compared to a new installation.
- Recycling resources is more sustainable than importing new material.
- Salvaging plants where they would otherwise be destroyed can provide species that are not available commercially and plant material that is inexpensive for the project.
- Existing materials are already adapted to specific site conditions.
- A natural aesthetic can be more easily recreated with salvaged plant material.

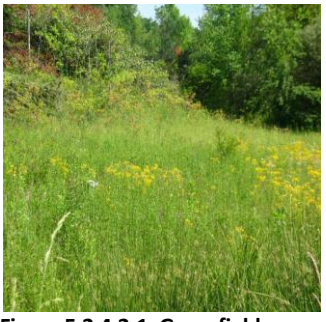

Figure 5.2.4.2-1. Greenfield meadow with golden groundsel slated for construction.

Disadvantages

- Salvage is unfeasible or uneconomical if existing vegetation onsite is minimal or of low quality.
- Initial site investigation is necessary to determine salvage possibilities.
- Removal, planting, and maintenance of plant blocks require forethought and training.

Figure 5.2.4.2-2. Trees in suburban development slated for construction.

Applications

Sites with existing, excellent to fair quality soil and vegetation that will be removed or impacted by the site program. The size of the property and the site functions are not determinants. However, this method is most cost-effective for large sites with newly created or denuded steep slopes that will not be maintained as lawn.

Applicable Protocols and Specifications

Protocol 3 Soil Testing

Design Considerations

Soil salvage is only worthwhile when the existing soil and ground layer are in good condition. The advantage of this technique is that the transplanted soil is biologically intact. Soil sods may be reset from the same place from which they have been removed—to restore a temporary disturbance (e.g., utility corridor)—or moved to a new location as part of a re-vegetation strategy. Additionally, soil blocks may be placed in a staggered pattern to save on manpower and materials with seeding in areas between blocks.

Figure 5.2.4.2-3. Modified backhoe.

Figure 5.2.4.2-4. Meadow salvage.

Figure 5.2.4.2-5. Meadow salvage truck.

<u>Transplanting Soil "Blocks"</u>

- Choose areas slated for disturbance that also have high-quality natural soil and desirable but movable vegetation. Such vegetation is often found in open meadows, old fields, or successional woodlands, where sufficient areas of young native species are the predominant ground layer.
- Cut the block to the required depth.
- Dig up blocks by machine (backhoe or modified backhoe) or by hand if labor is available or the area to be covered is small.
- Size the dimensions of the block to the method of transportation as well as to the size and requirements of the roots of the plants to be moved.
- Wooden pallets of 4 feet by 4 feet are often the cheapest and most easily available method of moving the blocks.
- Place excavated blocks on the palettes and move them with a forklift to a nearby site, or place them on a flatbed truck, depending on the proximity of the replacement site.

<u>Salvage Timing</u>

- Ideally, plant blocks should be moved **only once**—directly to the planting site. Minimal storage is best for the plants and minimizes operational costs.
- Ideally, plants should be salvaged during their dormant period (from leaf drop in fall to just before leaf out in spring).

- Planting should be done as soon as the ground is workable. If construction or other activities are still taking place and the planting site is unavailable during the optimum planting season, plants must be stored carefully in the shade, protected from construction damage, and watered weekly until planted.
- Of all planting methods, plant blocks adjust most easily to out-of-season planting.

Forest Soil and Leaf Layer Salvage

Salvaging forest soil and the leaf layer from areas of future clearance where buildings, etc. will be sited protects a valuable resource that can be used to revitalize damaged soils in natural or naturalized areas. Installing this soil will reintroduce organic matter and beneficial soil biota back into disturbed areas.

Transplanting Meadow Sods

Salvaged meadow sods provide immediate meadow cover at restoration sites, help absorb runoff, promote regrowth of trees from existing seedlings and/or dormant seed, and provide a source of diverse native plants and seeds not generally available from a nursery. Meadow sods are similar to thick-cut sod, with a depth of at least 6 to 8 inches.

Figure 5.2.4.2-6. Meadow sod on pallet.

Transplanting Small Trees and Herbaceous Perennials and Grasses

Salvaging seedling trees and herbaceous plants where they would otherwise be destroyed can provide the project with inexpensive plant material including species that often are not commercially available.

Transplanting Medium Trees and Shrubs

Medium trees represent a balance between appreciable size and economics. Medium trees include trees that are up to 10 feet tall and up to 4 inches in caliper diameter at breast height (DBH). These trees are too large for plant blocks, but can be salvaged through a variety of means including hand digging, tree spading, etc.

Transplanting Large and Very Large Trees

See Section 5.2.4.1, Protect Historic or Specimen Trees in this manual for further information.

Construction Sequencing

Soil Management

Soil management is often overlooked during conventional construction operations. Quality control for salvaged soil and imported replacement soil is also critical. Specific tasks related to soil management during construction include:

- Restrictions on construction activity within site protection zones.
- Soil salvage.

- Evaluation of rough subgrade water infiltration.
- Planting soil material acquisition.
- Testing and analysis for specification conformance.
- Inspection and testing of subgrade for preparation of subgrade.
- Preparation of mixes and testing for conformance.
- Installation and placement of soils.
- Decompaction of soils.
- Mock-up of planting soil profiles.
- Final in-place testing of soils.

Recommended Sequence for All Salvage Techniques

- Identify salvage sites and destination planting areas.
- Confirm that unit prices for the salvage operation are economical given the quantities.
- Delineate the salvage material and planting sites for the contractor's convenience.
- Perform sod removal operations (fall, winter or early spring).
- Move salvaged material to a staging area, if necessary.
- Move salvaged plants to final location and install (ideally in the fall).

Forest Soil and Leaf Layer Salvage Sequence

- Follows tree removal, but precedes clearing and grubbing.
- Push the top 3-inch layer of soil, containing semi-decomposed organic matter, leaves, nuts, seeds, corms, etc., into piles.
- Extract large woody branches and roots for chipping (chips can be mixed in if desired).
- Load and haul the mixed soil and organic matter directly to the planting site. "Scrapings" must not be stored for longer than two weeks.
- Spread the "scrapings" in a 1-inch (minimum) layer over the bare subsoil on the planting site.
- Cover with open weave burlap, plant through the burlap, and apply additional leaf litter mulch.

Figure 5.2.4.2-7. Forest soil salvage.

Meadow Sod Transplant Sequence

- Precedes tree removal, clearing, and grubbing.
- Confirm the salvage and planting locations in the field (by landscape architect or owner's representative).

- Cut and lift soil sods with a chainsaw or modified backhoe blade. Meadow sods are approximately 4 feet by 4 feet by 6 to 8 inches deep (thick enough to lift the root mat plus some soil).
- Place soil sods on a pallet. The sliding of the soil block off the backhoe blade should be at a low angle. A vibrator attached to the hoe and/or wax coating on the blade surface can facilitate the transfer of the soil sod "block" without crumpling.
- Transport pallets directly to the planting site.
- Prepare the planting site with a shallow trench, wide and deep enough to accept the sod mat. Excavated soil is placed on both sides of the trench. **Trench bottom should be rough**, not smooth and shiny.
- Unload pallets and carry by forklift to the edge of the trench. Gently slide sods off the pallets into the trench.
- Gently tamp soil sods (by foot) into the underlying soil. Backfill exposed edges of the soil sods with the stockpiled soil at the edge of the trench.
- Water in the soil sods. Provide supplemental water during dry weather (approximately one week of no rain), as needed, during the establishment period.

Figure 5.2.4.2-8. Meadow sod placement – foot tamping.

Figure 5.2.4.2-9. Meadow sod placement.

<u>Small Tree and Herbaceous Perennials and Grasses Salvage Sequence</u>

- Precedes tree removal, clearing, and grubbing.
- Confirm salvage and planting locations in the field (by landscape architect or owner's representative).
- Individual seedlings or saplings, small shrubs, and herbaceous plants may be dug by hand or machinery.
- Individual plants may be placed in small pots, trays, or frames. Keep soil intact and moist during the entire salvage process.
- Transport plants directly to final planting site or staging area.
- If transporting to staging area, place plants in areas with similar conditions to their original site. Protect plants from desiccation by wind. Provide supplemental irrigation during staging period.
- If transporting single plants in containers or individually balled and bagged to final planting site, dig planting hole 1.5 times the original root ball size. Locate plants in areas that are similar in exposure and slope to their original site. After planting, add "root dip" or "mycorrhizae" to soil to increase the rate of success. Protect small trees planted in a meadow (from mowing and herbivore damage) with wooden stakes, plastic tree tubes, or wire fencing.

- Compost may be tilled into the soil before planting or added to the soil after planting. Ensure that the compost material is cured and **not hot** (at same temperature as surrounding soil) before adding.
- Water plants and press soil around the roots to ensure there are no air pockets in the soil.
- Provide supplemental water during dry weather (no rain for one week), as needed during the establishment period.

Medium Tree and Shrub Salvage Sequence

- Precedes timbering tree removal, clearing, and grubbing.
- Preparation work for specific woody plants includes root pruning, canopy pruning, chemical treatments, and other measures to improve health. This preparation is most effective if done throughout the growing season prior to the move, 9 to 14 months in advance.
- Confirm the salvage locations and planting locations in the field (by landscape architect or owner's representative).
- Dig individual trees by hand or with small machinery.
- Place individual plants in pots, bags, or burlap. It is important to keep the soil intact and prevent drying out during the entire transplant process.
- Transport plants directly to final planting site or staging area.
- If transporting to staging area, place plants in areas that are similar in exposure to their original site and protect them from wind. Provide supplemental irrigation during staging period.

Figure 5.2.4.2-10. Small tree salvage.

- For planting, dig a hole that is 1.5 times the original root ball size and locate plants in areas that are similar in exposure and slope to their original site. The top of the root ball (trunk flare) should be set at a maximum of 1 inch above finished grade. Adding "mycorrhizae" to the soil will increase the success rate of transplants.
- To mulch individual trees, **do not create "mulch pyramids."** Instead create a hollow saucer encircled with a low mulch berm around the tree to hold in water.

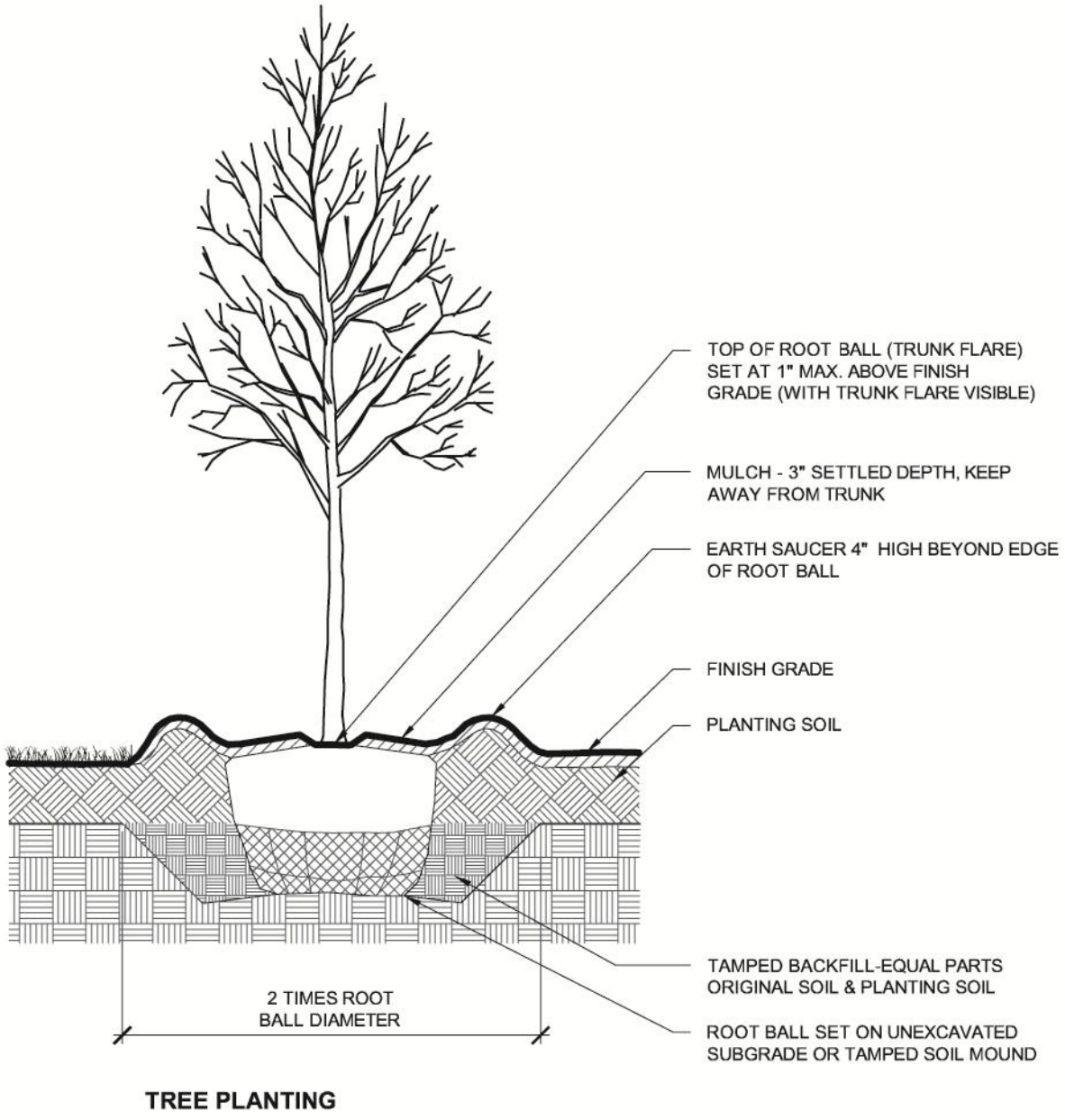

Figure 5.2.4.2-11. Tree planting detail.

- Compost may be tilled into the soil before planting or added to the soil after planting. Ensure that the material is cured and **not hot** (at same temperature as surrounding soil) before adding.
- Water plants and press soil around the roots to ensure there are no air pockets in the soil.
- Provide supplemental water during dry weather (no rain for one week), as needed during the establishment period.

Operations and Maintenance

Establishment

Newly transplanted sods or individual plants will require supplemental water during dry weather (no rain for one week), as needed during the establishment period.

Transplant Shock

The larger a tree is at the time of planting, the longer it will take to recover from transplant shock. The time to recover from transplanting is estimated to be between 6 and 12 months per caliper inch, depending on the project's latitude and elevation (6 months in Florida versus 12 months in Chicago). A tree will need water regularly during the recovery period. Monitor to ensure health.

Criteria Checklist BMP 5.2.4.2

ITEM DESCRIPTION	YES	N/A
The following checklist provides a summary of design guidance by the owner/applicant for successful implementation.		
• Confirm salvage area(s) and placement area(s) in the field with a landscape architect or owner's representative.	☐	☐
• Consult an arborist to determine what trees are eligible for salvage. Note species and caliper. Illustrate what percentage of eligible trees will be salvaged. Provide arborist report.	☐	☐
• Salvage area(s), salvage trees, placement area(s), and corresponding protection zones shall be clearly identified.	☐	☐
• Illustrate what percentage of the overall area of disturbance is eligible for salvage and compare that to the identified salvage area.	☐	☐
• Provide written description of any work that may need to be performed within salvage, placement, and tree protection zones and methods to be used.	☐	☐
• Provide note on plans: *"Topping trees is not allowed. Trees removed or having their tops cut shall be replaced with the equivalent inches of removed trees."*	☐	☐
• Provide note on plans: *"Thinning is allowed and may include manual removal of non-salvaged trees within the tree protection zone of the salvaged trees. NO motorized/wheeled or track vehicles allowed within tree protection zone of the salvaged trees."*	☐	☐
• Note on plans: *"Salvage area and tree protection measures will be maintained at all times. Additional protection measures will be installed if deemed necessary by onsite inspection."*	☐	☐
• If salvaged material will be transported to a staging area prior to installation, ensure that the staging area is in an area of similar condition to the salvage site.	☐	☐
• Ensure that salvaged material placed in staging areas is protected from wind desiccation.	☐	☐
• Ensure that salvaged material placed in staging area will be provided with supplemental irrigation during the staging period.	☐	☐
• Provide supplemental water during dry weather as needed during the establishment period.	☐	☐
• Monitor salvaged material to ensure health.	☐	☐
• Retain a certified arborist to perform tree and root pruning necessary for tree transplanting.	☐	☐